PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	**Maletz, Kruschel, Plaumann**
Application No.:	**10/534176**
Filed:	**May 22, 2003**
For:	**COMPOSITE MATERIAL AND USE OF A COMPOSITE MATERIAL**
Examiner:	**Michael Pepitone**
Group Art Unit:	**1796**

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Docket No.: H01.2I-11874-US01

AMENDMENT AFTER FINAL WITH RCE

This Amendment is in response to the Final Office Action dated August 29, 2008.

An extension of time is required to make this response timely. If no separate petition is enclosed, Applicants hereby petition for an extension of time sufficient to make the response timely. In the event that this response requires the payment of government fees and payment is not enclosed, please charge Deposit Account No. 22-0350.

Please amend the application as follows:

Amendments To The Specification:

None

Amendments To The Claims:

Please claims 19 and 20.

1. (Currently Amended) Composite material with a polymerisable organic binder and a filler, characterised in that it contains filler particles obtained by spray drying sols and post-curing the particles at 800 – ~~1200~~ <u>1000</u> degrees Celsius, which particles have the shape of a torus and an average external diameter in the region of 0.5-100 μm.

2. (Previously Presented) Composite material according to claim 1 which additionally contains a silica sol.

3. (Currently Amended) Composite material according to claim 1, characterised in that~~.~~ polymerisable organic binder and filler are in a quantity of 1 to 90 wt. %.

4. (Currently Amended) Composite material according to ~~either~~ claim 2, characterised in that the filler contains 50 to 100 wt. % of the filler particles with the shape of a torus.

5. (Previously Presented) Composite material according to claim 1, characterised in that the filler contains additional fragment-shaped and/or spherical inorganic filler particles.

6. (Previously Presented) Composite material according to claim 1, characterised in that the filler additionally contains non-torus-shaped filler particles made from silicon dioxide.

7. (Previously Presente*d*) Composite material according to claim 6, characterised in that the non-torus-shaped filler particles are produced from pyrogenic and/or precipitated silicic acid and/or silicon dioxide sols and/or from a dispersion of pyrogenic and/or precipitated silicic acid.

8. (Previously Presented) Composite material according to claim 1, characterised in that the torus-shaped and/or non-torus-shaped filler particles are silanized.

9. (Previously Presented) Composite material according to claim 1, characterised in that the organic binder includes at least one of the following materials: ethylenically unsaturated monomers and oligomers, epoxides, ormocers, ceramers, liquid crystal systems, spiro-orthoesters, oxethane, polyurethane, polyester, A-silicon and C-silicon, polycarbonic acids.

10. (Previously Presented) Composite material according to claim 1, characterised in that the organic binder cures chemically and/or photochemically.

11. (Previously Presented) Composite material according to claim 1, characterised in that the torus-shaped filler particles have an average external diameter in the region of 1 and 50 μm.

12. (Previously Presented) Composite material according to claim 1, characterised in that the torus-shaped filler particles have an internal diameter in the region of 0.2-20 μm.

13. (Previously Presented) Composite material according to claim 12, characterised in that the torus-shaped filler particles have an internal diameter in the region of 0.4-4.0 μm.

14. (Previously Presented) Composite material according to claim 1, characterised in that it contains 15-70 wt. % filler with torus-shaped filler particles.

15. (Previously Presented) Composite material according to claim 1, characterised in that the filler particles contain silicon dioxide and/or heavy metal oxides with an atomic number of greater than 28.

16. (Previously Presented) Composite material according to claim 15, characterised in that the heavy metal oxides are selected from the group of zirconium oxide, ceroxide, tin oxide, zinc oxide, yttrium oxide, strontium oxide, barium oxide, lanthanum oxide, bismuth oxide and compounds thereof.

17. (Previously Presented) Dental composite material according to claim 1.

18. (Previously Presented) A method of filling teeth comprising the steps of:

1) providing polymerisable composite material with a polymerisable organic binder and a filler, characterised in that it contains filler particles obtained by spray drying sols and post-curing the particles at 800 – 1200 degrees Celsius, which particles have the shape of a torus and

an average external diameter in the region of 0.5-100 μm and

2) filling cavities in teeth with the material.

19-20. (Canceled)

Amendments To The Drawings:

None

Remarks

This Amendment is in response to the Final Office Action dated August 29, 2008.

A full three month extension of time is required and requested.

First, it is noted that the Office Action refers to the Amendment of April 15, 2008 but does not reference the Supplemental Amendment of May 15, 2008 which clearly shows in the PAIR records. Applicant assumes that the Amendment has been entered because claims 19-20 were mentioned. However no mention was made of the submitted drawings.

Claims 19-20 have been canceled. Claims 3 and 4 have been amended. The Examiner's assistance in correcting those claims is appreciated. Claim 1 has been amended to alter the range of temperature post-curing.

§103(a) Rejections of Claims 1-18 over Jones et al.

Claims 1-18 were rejected as being obvious over Jones et al., U.S. Patent Publication No. 2002/0193463 (Jones '463).

In the relevant paragraphs on pages 4 and 5 of the examination report, the examiner justifies the rejection of claim 1 for the reason that Jones '463 teach a filler for dental composite materials which comprises filler particles in the shape of a doughnut/torus, which are heat-treated at 600°C.

According to the Office Action, this state of the art discloses the general conditions of the claim, and it is not inventive to discover the optimum or executable ranges by routine experimentation. The Office Action contends that a skilled person would have been motivated to do this, since the conversion of silica gel into silica glass, as well as the formation of the holes in the discs of the composition, is influenced by the temperature of the furnace.

In this respect, it has to be noted first that Jones et al. does not teach any dependence of the conversion of silica gel into silica glass on the furnace temperature, and that it also does not teach any dependence of the formation of holes in the discs on the furnace temperature. Instead, Jones '463 teaches that the conversion is completed by the formation of holes at 600°C. It cannot be deduced from Jones et al. that in addition, this conversion or hole formation, respectively, proceeds differently depending on temperature. In particular, Jones '463 teaches no interrelationship between the furnace temperature and the smoothness of the surface of the torus-shaped particles. However, according to the invention, the smooth shaping of the surface of the torus-shaped particles **is decisive** in particular. This is another target than the conversion of silica gel into silica glass and the formation of holes in the discs.

The filler particles described and depicted in the figures in Jones '463 have a porous surface. According to the comment of the applicant New Age Biomaterials, Inc. of July 24, 2006 in the European examination procedure concerning EP 1 124 529 B1, the matrix material engages into the porous walls of the particles, through which the matrix material is interlocked with the filler particles. The improved fracture toughness and wear resistance of a dental material containing the filler particles are attributed to this interlocking. Jones '463 designate the fracture toughness and wear resistance of the composite material as the objective of the improvement (paragraph 9, abstract). However, the investigations of the present applicant had the result that the torus-shaped filler particles feature porous surfaces just after post-curing at temperatures around 600°C. According to the aim of Jones '463 to produce porous filler particles in order to increase the fracture toughness and the wear resistance, the indicated treatment temperature of 600°C is optimum.

In contrast, the smooth surface of the torus-shaped filler particles of the composite material according to the present invention has the surprising effect that the overall filler content of the composite material can be substantially increased. As a consequence, the material parameters flexural strength, flexural elasticity module and volume shrinking of the composite material can be significantly improved. Concerning this, the attached investigation report (translated from original in German language) is presented, in which one of the

inventors has presented the effects of the temperature of sintering or post-curing, respectively, on the condition of the surface of the torus-shaped filler particles and on the material parameters mentioned above, which were detected in experiments. The effects of the sintering temperature on the condition of the surface are obvious from the photographs in particular.

The photo images 1 to 3 (filler particles post-cured and not post-cured at 400 and 600°C) demonstrate the aggregation of nanoscale primary particles into tori. In this, the nanoscale primary particles completely dominate the grainy structure of the surface morphology of the tori. At 900°C, the nanoscale pattern changes and fuses together into a smooth surface structure. The unevenness of the surface still visible in the image 4 is in the range of 15 nm, and thus in a much smaller order of magnitude than the pores of the torus-shaped filler particles shown in the figures of Jones '463, so that they strongly differ in structure and order of magnitude from the same. From this results a notable decrease of the specific surface area of the filler particles of the present invention. This decrease of the specific surface area has the macroscopic effect that due to reduced interaction forces, the amount of torus shaped filler particles which a resin matrix can incorporate at the same consistency, i.e. at equal rheological properties, increases significantly. Through this, the mechanical properties flexural strength, flexural elasticity module and volume shrinking of the composite material are significantly improved.

The effects on the condition of the material are represented in the table of the attached experimental report and explained in detail in the experimental report.

The surprising advantageous properties of the composite material of the present invention are an indication of the non-obviousness of the invention.

According to the official notification, the composite material of claim 1 already fulfils the prerequisite of novelty for patent protection. Taking into account the above statements concerning objective Jones '463 (especially tori with porous surface for improved wear resistance) and the surprising technical effect of the post-curing temperature in

particular, also the prerequisite of non-obviousness has to be attributed to the composite material for protection. The rejection is respectfully traversed.

Conclusion

It is respectfully submitted that claims 1-18, as amended, are patentable and that the arguments, Inventor's paper and photographs show the claims are not obvious over Jones '463. An early notice to that effect is requested.

Respectfully submitted,

VIDAS, ARRETT & STEINKRAUS

Date: February 27, 2009

By: /Scott Q. Vidas/
Scott Q. Vidas
Registration No.: 30812

6640 Shady Oak Dr., Suite 400
Eden Prairie, MN 55344-7834
Telephone: (952) 563-3000
Facsimile: (952) 563-3001

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